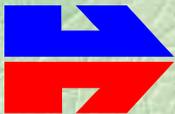


# Integrated Land Use, Transportation, Environment (ILUTE) Modeling Research in Canada: An Introduction

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Joint Program in  
Transportation  
University of Toronto



# Organization of ILUTE Presentations

Discussion of the ILUTE research program is split into 5 components:

1. Introduction (EJM & JDH)
2. The ILUTE - TLUMIP2 Linkage: Questions Arising (JDH)
3. Agent-based Microsimulation of Business Establishments in ILUTE (JDH)
  1. A Unified Model of Household Decision-Making (EJM)
  2. Conclusions (EJM & JDH)

# Introduction to ILUTE

1. The ILUTE consortium
2. ILUTE history
3. ILUTE design principles

# The ILUTE Consortium

Canadian universities involved:

- University of Calgary\*
- Université Laval
- McGill University
- McMaster University
- University of Toronto\*
- Wilfrid Laurier University

\* Primary ILUTE modeling sites.

# ILUTE Consortium, cont'd

Primary funding is from a 5-year Social Sciences & Humanities Research Council (SSHRC) Major Collaborative Research Initiative (MCRI) grant.

- 16 individual projects
- 10 co-investigators

Some additional funding from individual research grants and various public sector agencies (e.g., Cities of Calgary, Toronto and Edmonton, and the Quebec Ministry of Transportation)

# ILUTE History (1992-93)

Origins in early collaboration between University of Toronto & McMaster University.

Funded by seed money from Ontario Ministry of Energy & Environment.

Resulted in development of a prototype integrated model (IMULATE).

(Independently Doug Hunt working on MEPLAN & other integrated modeling applications.)

# ILUTE History (1995-98)

## NSERC Collaborative Project Grant

- Added Laval & Calgary to the network
- Conceptual work
- Prototype architecture/proof of principle
- Small sample retrospective surveys
  - residential mobility
  - residential spatial search processes
  - household auto ownership/transactions
- Developed relationships among network partners

In parallel Miller, Hunt & Kriger: TCRP Project H-12,  
*Integrated Transportation - Land Use Models and  
Their Applications to Transit Policy Analysis*

# ILUTE History 1999-present

Network collaborators further expanded under MCRI/GEOIDE funding (+ other).

- GEOIDE 1999-2002
- MCRI 2000-2005

Emphasis in MCRI is on behavioural foundations underlying models.

However, ILUTE development/elaboration has continued under MCRI.

# ILUTE Current Status

- Primary model development work at Calgary & Toronto.
- “Regional lab” concept.
  - Different approaches/components in different locations
  - Structured “conversations” between groups
- Software system as “laboratory”
  - Building very generalized, flexible software
- Novel data collection to support estimation of dynamic models
  - retrospective surveys
  - panel survey

# ILUTE Status, cont'd

## “ILUTE West” (Calgary):

- Building on Oregon work
- Main focus on:
  - intra-urban economic processes
  - firm location, “firmography”, etc.
- Calgary/Edmonton surveys
  - activity/travel
  - shipper activity
  - residential mobility
  - business establishment mobility

# ILUTE Status, cont'd

## “ILUTE East” (Toronto)

- Activity-based modeling
- Residential location
- Housing supply
- Auto ownership
- Energy/emissions
- Population synthesis
- Overall ILUTE architecture/software

# Panel Survey

- In March 2002 a 3-year panel survey was launched to gather detailed information about household activity scheduling behavior.
- 300 households in each of Toronto & Quebec City.
- 1 week activities per person 16+ years old.
- CHASE survey method in Toronto; paper diary in Q.C.

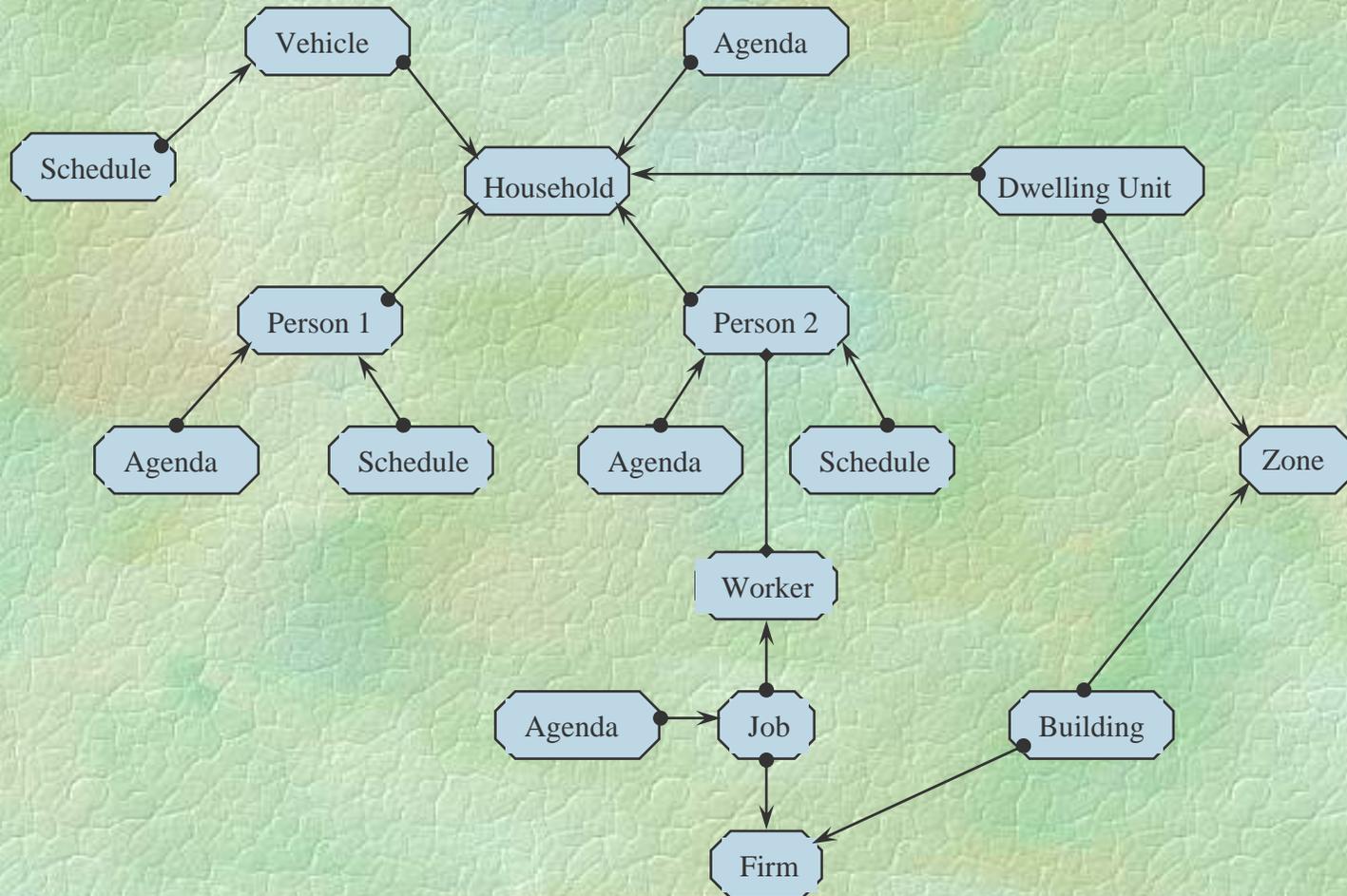
# ILUTE Design Principles

- Fully microsimulation-based
- Fully object-oriented/agent-based in design & implementation
- Full population synthesis
- Household & firm based
- Comprehensive
  - land use
  - activity/travel
  - urban economics
  - auto ownership
  - demographics
  - emissions/energy use
- A **framework** for model development rather than a model *per se*.

# Object-Oriented Microsimulation

- Object-orientation is more than a programming method; it provides a rigorous language/conceptual framework for the development of complex behavioral models
- A major theme within ILUTE is to “start fresh” in our model design and to build “from the ground up” our modeling system explicitly within an object-based microsimulation framework
- In particular, emphasis is placed on developing a high-fidelity **class design** and **system semantics** within which many behavioral assumptions might be implemented and tested

# Partial View of Relationships Among System Objects



# Household-Level Models

Household-level models are required to “properly” deal with many system components:

- housing location/type choice
- automobile ownership
- demographics/household structure/lifecycle stage
- activity/travel scheduling

Households:

- share **resources** among household members
- **constrain** member behavior
- **condition** member decision-making
- **generate** activities

# Relationship Between Persons & Household

